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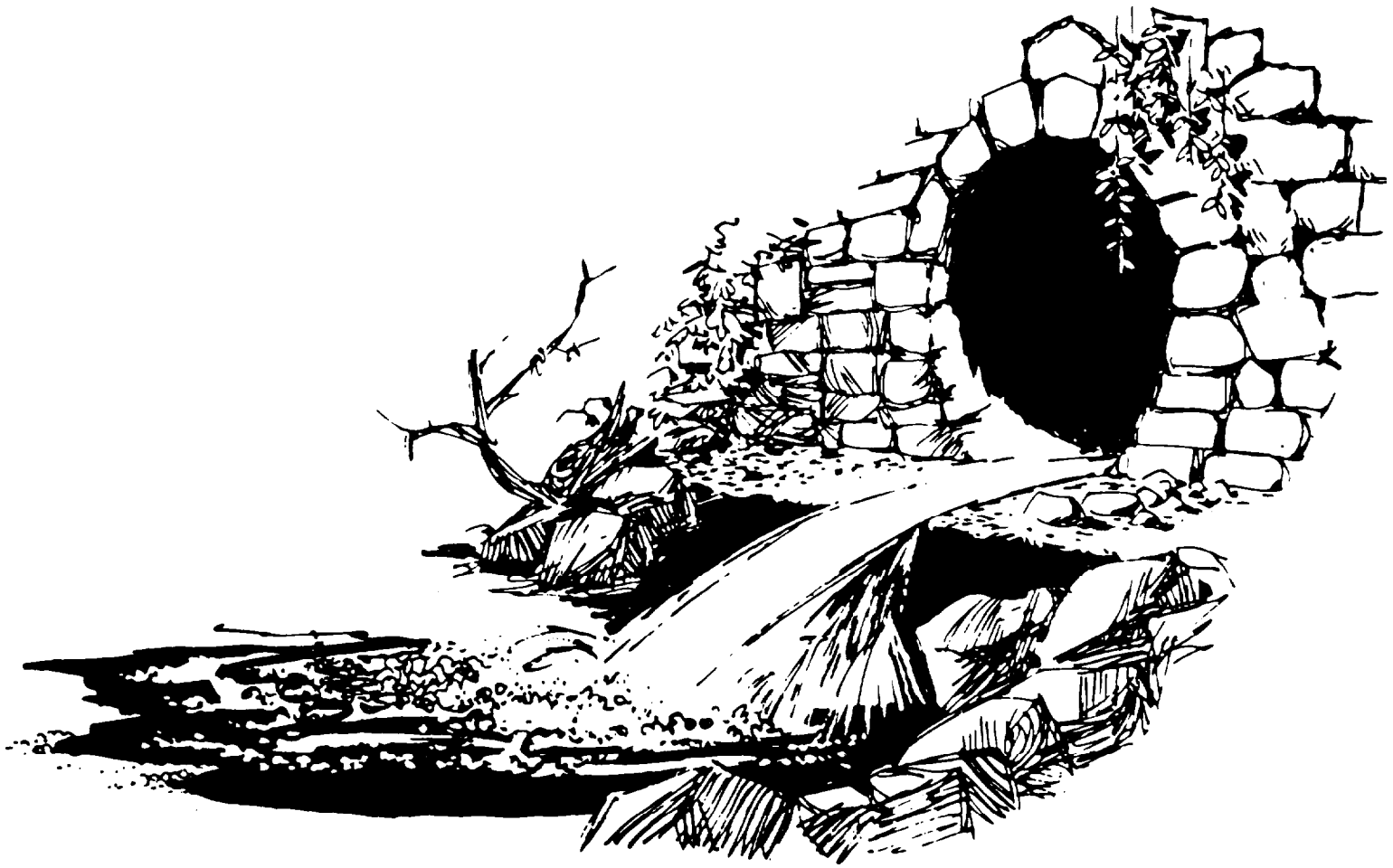
Combined Sewer Overflows

Guidance For Nine Minimum Controls



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY 31 1995

OFFICE OF WATER

MEMORANDUM

SUBJECT: Guidance for Nine Minimum Controls

FROM: Michael B. Cook, Director (4201)
Office of Wastewater Management

TO: Interested Parties

I am pleased to provide you the Environmental Protection Agency's (EPA's) guidance document on the implementation of the nine minimum controls for correction of combined sewer overflows (CSOs). This document is one of eight being prepared to foster implementation of EPA's CSO Control Policy. The CSO Control Policy, issued on April 11, 1994, establishes a national approach under the National Pollutant Discharge Elimination System (NPDES) permit program for controlling discharges into the nation's waters from combined sewer systems.

To facilitate implementation of the CSO Control Policy, EPA is preparing guidance documents that can be used by NPDES permitting authorities, affected municipalities, and their consulting engineers in planning and implementing CSO controls that will ultimately comply with the requirements of the Clean Water Act.

The nine minimum controls are identified in the CSO Control Policy as minimum technology-based controls that can be used to address CSO problems without extensive engineering studies or significant construction costs, prior to the implementation of long-term control measures. This document has been prepared to provide guidance to municipalities on how to implement the nine minimum controls and how to document their implementation. Documentation should be completed as soon as practicable but no later than January 1, 1997.

This guidance has been reviewed extensively within the Agency as well as by municipal groups, environmental groups, and other CSO stakeholders. I am grateful to all who participated in its preparation and review, and believe that it will further the implementation of the CSO Control Policy.

If you have any questions regarding the manual or its distribution, please call Norbert Huang in the Office of Wastewater Management, at (202) 260-5667.

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ACRONYM LIST

Acronym	Term
BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practice
BPJ	Best Professional Judgment
CSO	Combined Sewer Overflow
CSS	Combined Sewer System
CWA	Clean Water Act
DWO	Dry Weather Overflow
EPA	Environmental Protection Agency
I/I	Infiltration/Inflow
LTCP	Long-term Control Plans
NMC	Nine Minimum Controls
NPDES	National Pollutant Discharge Elimination System
O&M	Operation & Maintenance
POTW	Publicly Owned Treatment Works
WQS	Water Quality Standards

CHAPTER 1
INTRODUCTION

1.1 Background

Combined sewer systems (CSSs) are wastewater collection systems designed to carry sanitary sewage (consisting of domestic, commercial, and industrial wastewater) and storm water (surface drainage from rainfall or snowmelt) in a single pipe to a treatment facility. CSSs serve about 43 million people in approximately 1,100 communities nationwide. Most of these communities are located in the Northeast and Great Lakes regions. During dry weather, CSSs convey domestic, commercial, and industrial wastewater. In periods of rainfall or snowmelt, total wastewater flows can exceed the capacity of the CSS and/or treatment facilities. When this occurs, the CSS is designed to overflow directly to surface water bodies, such as lakes, rivers, estuaries, or coastal waters. These overflows—called combined sewer overflows (CSOs)—can be a major source of water pollution in communities served by CSSs.

Because CSOs contain untreated domestic, commercial, and industrial wastes, as well as surface runoff, many different types of contaminants can be present. Contaminants may include pathogens, oxygen-demanding pollutants, suspended solids, nutrients, toxics, and floatable matter. Because of these contaminants and the volume of the flows, CSOs can cause a variety of adverse impacts on the physical characteristics of surface water, impair the viability of aquatic habitats, and pose a potential threat to drinking water supplies. CSOs have been shown to be a major contributor to use impairment and aesthetic degradation of many receiving waters and have contributed to shellfish harvesting restrictions, beach closures, and even occasional fish kills.

1.2 History of the CSO Control Policy

Historically, the control of CSOs has proven to be extremely complex. This complexity stems partly from the difficulty in quantifying CSO impacts on receiving water quality and the site-specific variability in the volume, frequency, and characteristics of CSOs. In addition, the financial considerations for communities with CSOs can be significant. The U.S. Environmental

Protection Agency (EPA) estimates the CSO abatement costs for the 1,100 communities served by CSSs to be approximately $41.2 billion.

To address these challenges, EPA's Office of Water issued a National Combined Sewer Overflow Control Strategy on August 10, 1989 (54 *Federal Register* 37370). This Strategy reaffirmed that CSOs are point source discharges subject to National Pollutant Discharge Elimination System (NPDES) permit requirements and to Clean Water Act (CWA) requirements. The CSO Strategy recommended that all CSOs be identified and categorized according to their status of compliance with these requirements. It also set forth three objectives:

- Ensure that if CSOs occur, they are only as a result of wet weather
- Bring all wet weather CSO discharge points into compliance with the technology-based and water quality-based requirements of the CWA
- Minimize the impacts of CSOs on water quality, aquatic biota, and human health from CSOs.

In addition, the CSO Strategy charged all States with developing state-wide permitting strategies designed to reduce, eliminate, or control CSOs.

Although the CSO Strategy was successful in focusing increased attention on CSOs, it fell short in resolving many fundamental issues. In mid-1991, EPA initiated a process to accelerate implementation of the Strategy. The process included negotiations with representatives of the regulated community, State regulatory agencies, and environmental groups. These negotiations were conducted through the Office of Water Management Advisory Group. The initiative resulted in the development of a CSO Control Policy, which was published in the *Federal Register* on April 19, 1994 (59 *Federal Register* 18688). The intent of the CSO Control Policy is to:

- Provide guidance to permittees with CSOs, NPDES permitting and enforcement authorities, and State water quality standards (WQS) authorities

- Ensure coordination among the appropriate parties in planning, selecting, designing, and implementing CSO management practices and controls to meet the requirements of the CWA

- Ensure public involvement during the decision-making process.

The CSO Control Policy contains provisions for developing appropriate, site-specific NPDES permit requirements for all CSSs that overflow due to wet weather events. It also announces an enforcement initiative that requires the immediate elimination of overflows that occur during dry weather and ensures that the remaining CWA requirements are complied with as soon as possible.

1.3 Key Elements of the CSO Control Policy

The CSO Control Policy contains four key principles to ensure that CSO controls are cost-effective and meet the requirements of the CWA:

- Provide clear levels of control that would be presumed to meet appropriate health and environmental objectives

- Provide sufficient flexibility to municipalities, especially those that are financially disadvantaged, to consider the site-specific nature of CSOs and to determine the most cost-effective means of reducing pollutants and meeting CWA objectives and requirements

- Allow a phased approach for implementation of CSO controls considering a community's financial capability

- Review and revise, as appropriate, WQS and their implementation procedures when developing long-term CSO control plans to reflect the site-specific wet weather impacts of CSOs.

In addition, the CSO Control Policy clearly defines expectations for permittees, State WQS authorities, and NPDES permitting and enforcement authorities. These expectations include the following:

- Permittees should immediately implement the nine minimum controls (NMC), which are technology-based actions or measures designed to reduce CSOs and their effects on receiving water quality, as soon as practicable but no later than January 1, 1997.

- Permittees should give priority to environmentally sensitive areas.

- Permittees should develop long-term control plans (LTCPs) for controlling CSOs. A permittee may use one of two approaches: 1) demonstrate that its plan is adequate to meet the water quality-based requirements of the CWA ("demonstration approach"), or 2) implement a minimum level of treatment (e.g., primary clarification of at least 85 percent of the collected combined sewage flows) that is presumed to meet the water quality-based requirements of the CWA, unless data indicate otherwise ("presumption approach").

- WQS authorities should review and revise, as appropriate, State WQS during the CSO long-term planning process.

- NPDES permitting authorities should consider the financial capability of permittees when reviewing CSO control plans.

Exhibit 1-1 illustrates the roles and responsibilities of permittees, NPDES permitting and enforcement authorities, and State WQS authorities.

In addition to these key elements and expectations, the CSO Control Policy also addresses important issues such as ongoing or completed CSO control projects, public participation, small communities, and watershed planning.

1.4 Guidance to Support Implementation of the CSO Control Policy

To help permittees and NPDES permitting and WQS authorities implement the provisions of the CSO Control Policy, EPA has developed the following guidance documents:

- *Combined Sewer Overflows - Guidance for Long-Term Control Plan* (EPA 832-B-95-002)

- *Combined Sewer Overflows - Guidance for Nine Minimum Controls* (EPA 832-B-95-003)

- *Combined Sewer Overflows - Guidance for Screening and Ranking Combined Sewer System Discharges* (EPA 832-B-95-004)

Exhibit 1-1. Roles and Responsibilities

Permittee	NPDES Permitting Authority	NPDES Enforcement Authority	State WQS Authorities
• Evaluate and implement NMC • Submit documentation of NMC implementation by January 1, 1997 • Develop LTCP and submit for review to NPDES permitting authority • Support the review of WQS in CSO-impacted receiving water bodies • Comply with permit conditions based on narrative WQS • Implement selected CSO controls from LTCP • Perform post-construction compliance monitoring • Reassess overflows to sensitive areas • Coordinate all activities with NPDES permitting authority, State WQS authority, and State watershed personnel	• Reassess/revise CSO permitting strategy • Incorporate into Phase I permits CSO-related conditions (e.g., NMC implementation and documentation and LTCP development) • Review documentation of NMC implementation • Coordinate review of LTCP components throughout the LTCP development process and accept/approve permittee's LTCP • Coordinate the review and revision of WQS as appropriate • Incorporate into Phase II permits CSO-related conditions (e.g., continued NMC implementation and LTCP implementation) • Incorporate implementation schedule into an appropriate enforceable mechanism • Review implementation activity reports (e.g., compliance schedule progress reports)	• Ensure that CSO requirements and schedules for compliance are incorporated into appropriate enforceable mechanisms • Monitor compliance with January 1, 1997, deadline for NMC implementation and documentation • Take appropriate enforcement action against dry weather overflows • Monitor compliance with Phase I, Phase II, and post-Phase II permits and take enforcement action as appropriate	• Review WQS in CSO-impacted receiving water bodies • Coordinate review with LTCP development • Revise WQS as appropriate: Development of site-specific criteria Modification of designated use to - Create partial use reflecting specific situations - Define use more explicitly Temporary variance from WQS

- *Combined Sewer Overflows - Guidance for Monitoring and Modeling* (EPA 832-B-95-005)
- *Combined Sewer Overflows - Guidance for Financial Capability Assessment* (EPA 832-B-95-006)
- *Combined Sewer Overflows - Guidance for Funding Options* (EPA 832-B-95-007)
- *Combined Sewer Overflows - Guidance for Permit Writers* (EPA 832-B-95-008)
- *Combined Sewer Overflows - Questions and Answers on Water Quality Standards and the CSO Program* (EPA 832-B-95-009)

1.5 Goal of this Guidance

The goal of this document is to help the CSO community, particularly municipal public works officials or planning and engineering consultants, evaluate, understand, and implement, as well as document, the NMC. The examples presented in this document illustrate different measures available to address a particular control. Appropriate control measures will be site-specific and a municipality may select from several available measures to effectively implement each minimum control. EPA encourages municipalities to be creative and to explore innovative and cost-effective measures in implementing the NMC to address their specific CSO problems. The NMC are not necessarily distinct and separate from one another. Many control measures can address and facilitate more than one of the controls at the same time (e.g., street sweeping can address both the "Control of Solids/Floatables" and the "Pollution Prevention" controls). With the assistance of this guidance document, municipalities with CSOs should plan and pursue control measures that can achieve the ultimate goal of reducing overall CSO impacts in a holistic manner.

1.6 The Nine Minimum Controls

As described in the CSO Control Policy, municipalities should immediately implement best available technology economically achievable (BAT) or best conventional pollutant control technology (BCT). At a minimum, BAT/BCT should include the nine minimum controls (NMC), which are determined on a best professional judgment (BPJ) basis by the NPDES permitting authority. The NMC are controls that can reduce CSOs and their effects on receiving

(NMC), which are determined on a best professional judgment (BPJ) basis by the NPDES permitting authority. The NMC are controls that can reduce CSOs and their effects on receiving water quality, do not require significant engineering studies or major construction, and can be implemented in a relatively short period (e.g., less than approximately two years). Implementation of the NMC is among the first steps a municipality is expected to take in response to EPA's CSO Control Policy. EPA recognizes that many municipalities have made significant progress in implementing the NMC as a result of the 1989 CSO Strategy.

The NMC are as follows:

1. Proper operation and regular maintenance programs for the sewer system and CSO outfalls
2. Maximum use of the collection system for storage
3. Review and modification of pretreatment requirements to ensure that CSO impacts are minimized
4. Maximization of flow to the POTW for treatment
5. Elimination of CSOs during dry weather
6. Control of solid and floatable materials in CSOs
7. Pollution prevention programs to reduce containments in CSOs
8. Public notification to ensure that the public receives adequate notification of CSO occurrences and CSO impacts
9. Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls.

Each of the following chapters in this manual describes one of the NMC, its intended objectives, examples of control measures, considerations for implementation, and suggested documentation. In addition, where available, the chapters present case studies and performance and cost data.

1.7 Concurrent Efforts

When evaluating and implementing the NMC, the municipality should also be undertaking the following activities:

- Initiating the process to develop a long-term control plan (LTCP), including characterizing the CSS, CSOs, and receiving waters
- Meeting with the NPDES permitting authority and State WQS authority to discuss:
  - The materials expected to document implementation of the NMC
  - Monitoring, regulatory, and planning requirements that will affect the preparation of the LTCP.

1.8 Related Activities

The NPDES permitting authority should undertake, among other efforts, the following activities:

- Develop and issue Phase I NPDES permits requiring CSO communities to implement the NMC, within two years of notice from the NPDES permitting authority, but no later than January 1, 1997
- Develop and issue Phase II NPDES permits requiring continued implementation of the NMC and implementation of an LTCP.

If implementation of the NMC in Phase I and Phase II permits is determined to meet the technology-based requirements, the permit writer should not need to develop other technology-based effluent limitations.

Therefore, implementing the NMC is among the first steps a municipality should take to reduce CSO impacts. Minimum controls are *not* temporary measures; they should be a part of long-term efforts to control CSOs. A community that has already implemented a CSO control program will likely have made substantial progress in implementing the NMC. Such a community is still expected to provide documentation to the NPDES permitting authority to

demonstrate how its program addresses each minimum control. The NPDES permitting authority should then evaluate the extent to which each minimum control is satisfied.

The LTCP should describe the approaches for implementing and integrating the NMC into the long-term CSO control program. On a preliminary basis, the LTCP should describe the effectiveness of the NMC in reducing the frequency and magnitude of CSOs and in reducing impacts on receiving waters. Monitoring conducted under the NMC will likely provide such information as the number of overflow events or receiving water impacts, including fish kills or beach closures. Other impacts, such as pollutant load reductions and receiving water concentrations, will be ascertained through monitoring associated with LTCP development.

1.9 Documentation

The CSO Control Policy states that the municipality should submit to the NPDES permitting authority documentation on the implementation of the NMC. Documentation should include information that demonstrates:

- The alternatives considered for each minimum control
- The actions selected and the reasons for their selection
- The selected actions already implemented
- A schedule showing additional steps to be taken
- The effectiveness of the minimum controls in reducing/eliminating water quality impacts.

Each chapter of this manual presents examples of the information that should be documented for the minimum control presented in that chapter. The discussion is presented in the form of suggestions and objectives because each NPDES permitting authority (EPA Regional office or State agency) will likely have different implementation and documentation requirements. Meeting as early as possible with the NPDES permitting authority to determine its particular expectations will facilitate the NMC implementation process.

Generally, however, the documentation burden imposed by the NPDES permitting authority should be the minimum necessary to demonstrate that proper NMC measures are in place. The burden may vary according to the NPDES permitting authority's customary practices and the municipality's compliance record, among other factors. The NPDES permitting authority may choose to require the municipality to keep some records of NMC implementation on-site rather than requiring all documentation to be submitted. In these cases, NPDES inspectors can review NMC documentation that is on file during inspections.

CHAPTER 2

PROPER OPERATION AND REGULAR MAINTENANCE PROGRAMS

The first minimum control, proper operation and regular maintenance of the CSS and CSO outfalls, should consist of a program that clearly establishes operation, maintenance, and inspection procedures to ensure that a CSS and treatment facility will function in a way to maximize treatment of combined sewage and still comply with NPDES permit limitations. Implementation of this minimum control will reduce the magnitude, frequency, and duration of CSOs by enabling existing facilities to perform as effectively as possible. Essential elements of a proper operation and maintenance (O&M) program include maintenance of suitable records and identification of O&M as a high management priority.

The municipality should already have an established O&M program for its publicly owned treatment works (POTW). It may be very formal, with written manuals and operating forms and logs, or it may be informal, with few or no written manuals or established recordkeeping procedures. In either case, the steps involved in implementing this minimum control are the same: 1) assess how well the existing O&M program is being implemented, 2) determine whether or not the O&M program needs to be improved to satisfy the intent of the CSO Control Policy, 3) develop and implement the improvements to address CSOs, and 4) document any actions and report them to the NPDES permitting authority.

2.1 Elements of a Proper Operation and Maintenance Program

For the purposes of the CSO Control Policy, a proper O&M program generally should include the following:

- The organizations and people responsible for various aspects of the O&M program
- The resources (i.e., people and dollars) allocated to O&M activities
- Planning and budgeting procedures for O&M of the CSS and treatment facilities

- A list of the facilities (e.g., tide gates, overflow weirs) critical to the performance of the CSS
- Written procedures and schedules for routine, periodic maintenance of major items of equipment and CSO diversion facilities, as well as written procedures to ensure that regular maintenance is provided
- A process for periodic inspections of the facilities listed previously
- Written procedures, including procurement procedures, if applicable, for responding to emergency situations
- Policies and procedures for training O&M personnel
- A process for periodic review and revision of the O&M program.

2.1.1 Organizational Structure

The organizational structure can be shown with an organizational chart or other documents. The chart (or supplemental documents) should provide the names and telephone numbers of key personnel, the chain of command, and the relationships among various program components. In addition, the organizational structure should establish clear lines of communication, authority, and responsibility.

2.1.2 Budget

The O&M program records should show the resources currently available for O&M and the procedures for preparing and approving the annual O&M budgets. The budget should provide sufficient funds and personnel for routine O&M and a reasonable contingency amount for emergencies. Individuals responsible for day-to-day O&M should have the opportunity to participate in the budget preparation process so that the officials responsible for final budget preparation and approval are aware of O&M needs.

2.1.3 Critical Facilities

The O&M program should include an agreed-upon list of the most critical elements of the CSS and demonstrate that they receive an appropriate amount of attention. "Critical

elements" are those facilities that affect the performance of the CSS, CSO volumes, or CSO pollutant levels. The list should include regulator structures, tide gates, pumping stations, diversion structures, retention basins, sections of the sewer system prone to sedimentation, all CSO outfalls included (or to be included) in the NPDES permit, and wastewater treatment plants if they are used to treat a significant portion of the wet weather flows. The list and supplemental documents should include a physical description of each facility and its location.

2.1.4 Procedures for Routine Maintenance

The existing O&M program for a particular POTW should include documentation of procedures for routine maintenance of the major elements of the CSS. Only the critical elements identified above need to be included to document implementation of this minimum control. The program should focus on preventative maintenance to avoid failures during critical times, such as a period of heavy rainfall.

2.1.5 Non-Routine Maintenance and Emergency Situations

The O&M program should describe response procedures for emergency situations, particularly those requiring funds outside the approved annual budget. The NPDES permitting authority will expect to see that response can be quick, without unnecessary processes and procedures. It would be a good practice to establish a protocol for responding to emergencies at night, on holidays, or on weekends. The protocol should include the names and telephone numbers of employees or others designated to respond to the emergency.

Depending on the sensitivity of the receiving waters, the permittee might need to notify the NPDES permitting authority and the State public health agency during overflow events. It would be a good practice to maintain a list of people, organizations, and telephone numbers for appropriate regulatory agencies.

2.1.6 Inspections

The O&M program should describe the procedures for inspecting critical elements of the CSS. The NPDES permitting authority will expect the municipality to have an established

program for periodic inspections. The appropriate frequency of inspections will depend on the type of facilities, historical records of performance and failure, sensitivity of nearby surface waters to CSOs, adequacy of the maintenance program, and other factors.

The O&M personnel should have check sheets, operating logs, and other easy-to-complete forms readily available. The forms should prompt field personnel to check critical items, record their observations, and recommend corrective actions, if necessary. For example, an inspection should identify whether there has been an overflow, whether debris has accumulated and needs to be removed, whether the device would operate correctly during the next storm, and whether any items need repair. In addition, inspections could be conducted of regulator devices and interceptors, trunks, and combined sewers during dry weather for blockages, excessive deposition of solids, excessive infiltration/inflow, and structural deterioration that needs to be corrected.

The municipality should also have an established process for the review of the completed inspection forms by supervisory and management personnel, submittal to the NPDES permitting authority, if required, and retention of the forms. In addition, the municipality should have a process for ensuring that necessary follow-up maintenance and repair actions, indicated by the inspection reports and operating logs, are scheduled and carried out.

2.1.7 Training

New employees should be trained in operation and safety procedures as soon as they begin duty, and opportunities for training and re-training of long-time employees should be available. Training includes an appropriate blend of classroom training and on-the-job training. The objective is to have well-trained employees who know their duties and how to report problems that require attention from CSS managers. EPA encourages the development of and adherence to a written policy on training.

2.1.8 Periodic Review of O&M Plans

O&M practices should be reviewed periodically and modified as necessary. It is good practice to involve field O&M personnel in this process. The O&M plan will likely be revised after completion of the LTCP to include agreed-upon long-term CSO controls. (See *Combined Sewer Overflows - Guidance for Long-Term Control Plan.* EPA, 1995c.)

2.2 Considerations

Frequent inspection, regular maintenance, and the timely repair of facilities, including tide gates and regulators, are cost-effective ways to improve the control of CSOs. The elimination of obstructions will increase the effective storage capacity of the system and the quantity of wet weather flows that can be delivered to the treatment plant.

The effective organization of overall O&M operations, a specific commitment of resources for maintenance of the collection system, the assignment of sufficient personnel and equipment for inspection and maintenance at the appropriate frequency, and timely repairs might require increases in O&M budgets. In some cases, reorganization of the operational structure might be necessary. Ultimately, the effectiveness of an O&M program depends on the resources allocated and the extent to which the CSOs are caused by conditions that can be mitigated by O&M practices.

2.3 Examples of Implementation

The following list provides examples of O&M program approaches used by several different municipalities:

- Lansing, Michigan, has 40 regulators that are inspected twice per week and immediately following any wet weather event.
- Jersey City, New Jersey, has tide gates and 31 regulators that are inspected in sequence by two assigned crews, enabling each regulator to be inspected at least twice per month. Crews perform cleanings and minor repairs when possible. Each inspection is documented.

- Elizabeth, New Jersey, has a CSS with 41 regulators of varying design. All syphons, regulators, and tide gates in the system are inspected daily. All syphons are jet-cleaned monthly.

- New York City has more than 450 regulators that are inspected on a regular schedule. Certain regulators identified as critical are inspected more often. Pump stations, most of which have overflow points, are inspected daily. Of the 183 people who maintain these elements of the sewer system, about 50 are assigned specifically to regulator and tide gate maintenance and inspection, and the remainder are involved with pump station operation. The city also has a shoreline inspection program and has mapped all discharge points, including CSO outfalls, storm water outfalls, industrial outfalls, and highway drains. Several vessels patrol the shorelines on a regular basis. If a dry weather overflow is suspected or observed, the maintenance crews will attempt to correct the problem immediately.

2.4 Documentation

The following elements are examples of documentation that could be submitted to the NPDES permitting authority to demonstrate that appropriate O&M activities to reduce the impacts of CSOs have been considered and have been or will be implemented:

- An identification of CSS components requiring routine operation and maintenance

- An evaluation of operation and maintenance procedures to include regular inspections; sewer, catch basin, and regulator cleaning; equipment and sewer collection system repair, or replacement where necessary

- An operation and maintenance manual and/or procedures for the CSS and CSO structures

- Resources allocated (manpower, equipment, training) for maintenance of the CSS and CSO structures

- A summary of inspections conducted and maintenance performed.